

Annual Technical Summary Meeting
2016 RI/FS Summary
Leviathan Mine Site, Alpine County, California
January 26, 2017



Presentation Outline

- ▶ Overview of Study Areas
- ▶ 2016 Remedial Investigation Activities
- ▶ 2016 RI/FS On-Going Monitoring Activities
- ▶ 2016 Feasibility Study Investigation Activities
- ▶ RI/FS Data Collection Progress
- ▶ 2017 RI/FS Activities

Study Areas

On-Property:

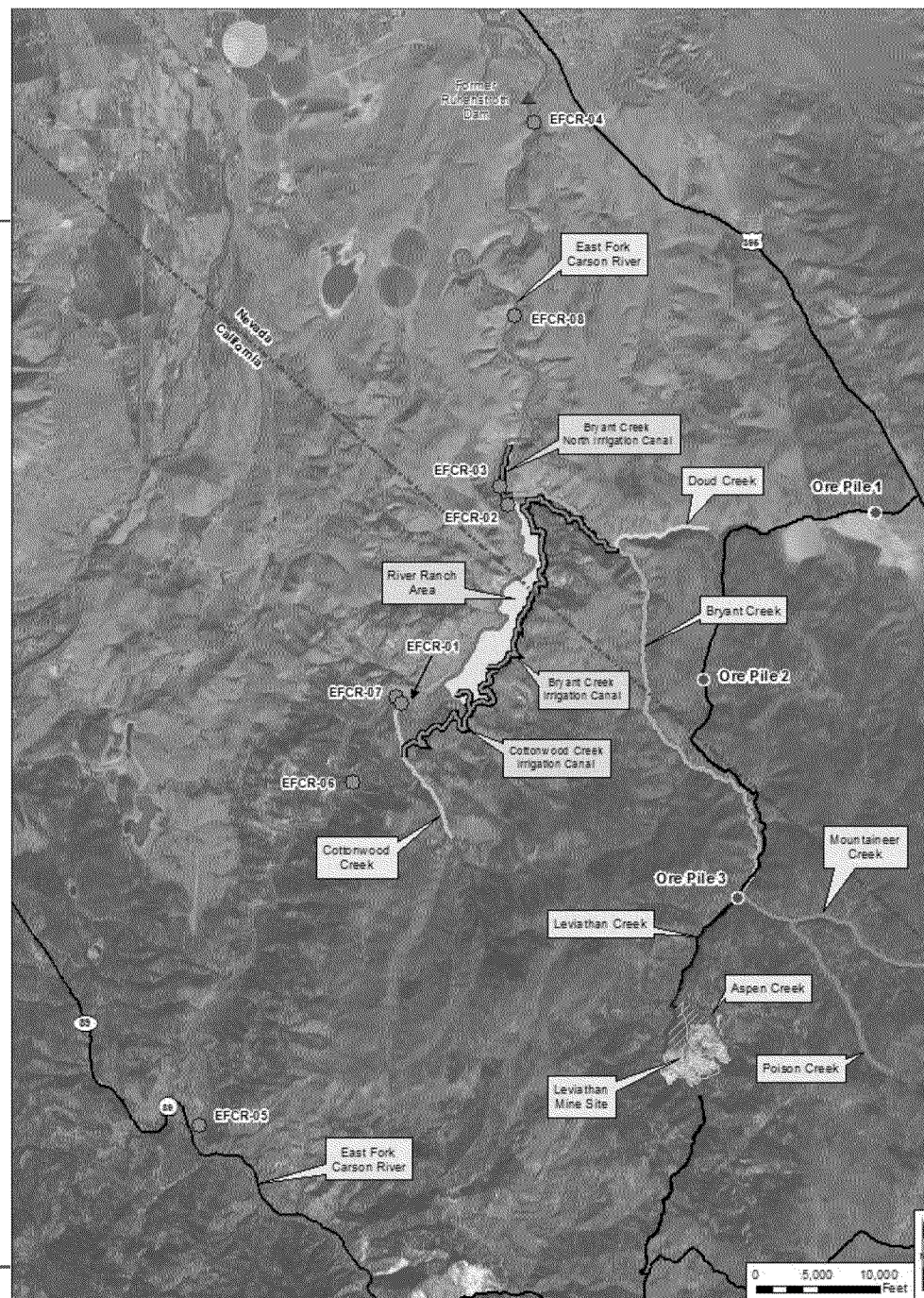
- ▶ Leviathan Creek Study Area (LCSA)
- ▶ Pit Study Area
- ▶ Aspen Creek Study Area (ACSA)

Off-Property:

- ▶ Downstream Study Area (DSA)
- ▶ Supplemental Study Areas (SSAs)
 - ▶ River Ranch
 - ▶ Suspected Ore Piles
 - ▶ East Fork Carson River
 - ▶ Leviathan Mine Road

Reference:

- ▶ Reference Study Area
 - ▶ On-Property and Off-Property
 - ▶ Cottonwood, Mountaineer, Poison Creeks
 - ▶ Supplemental Study Areas



2016 Remedial Investigation Activities

- ▶ Monitoring Well Installation
- ▶ LCSA Surface Water/Groundwater Interaction Investigation
- ▶ Supplemental Bryant Creek Surface Water Investigation
- ▶ Floodplain Soil Investigation
- ▶ Mine Waste Investigation
- ▶ Plant and Habitat-Related Soil Investigation
- ▶ Fish Survey and Sampling
- ▶ Sediment Quality Triad Sampling
- ▶ River Ranch Soil Investigation
- ▶ Leviathan Mine Road and Suspected Ore Pile Investigations
- ▶ East Fork Carson River Fluvial Soil and Surface Water Investigation
- ▶ Hydrocarbon Investigation



2016 Remedial Investigation On-Going Monitoring Activities

- ▶ Groundwater Monitoring
- ▶ Surface Water Monitoring
- ▶ AD Discharge Monitoring
- ▶ Meteorological Station and Evaporation Pan Monitoring & Maintenance
- ▶ Storm Water, Base Flow, and Snowmelt Runoff Monitoring & Maintenance
- ▶ Upper Tributary Weirs, Piezometers and Drive-Point Piezometers
- ▶ CUD and Aspen Seep Flow Station Data Collection & Maintenance



2016 Monitoring Well Installation

On-Property:

- ▶ LOC-34 (MW-47)

ACSA and LCSA Perimeter:

- ▶ LOC-37 (MW-51)
- ▶ LOC-38D (MW-50)
- ▶ LOC-38S (MW-52)
- ▶ LOC-39S (MW-49)
- ▶ LOC-40S (MW-48)
- ▶ LOC-41 (MW-53)

Reference:

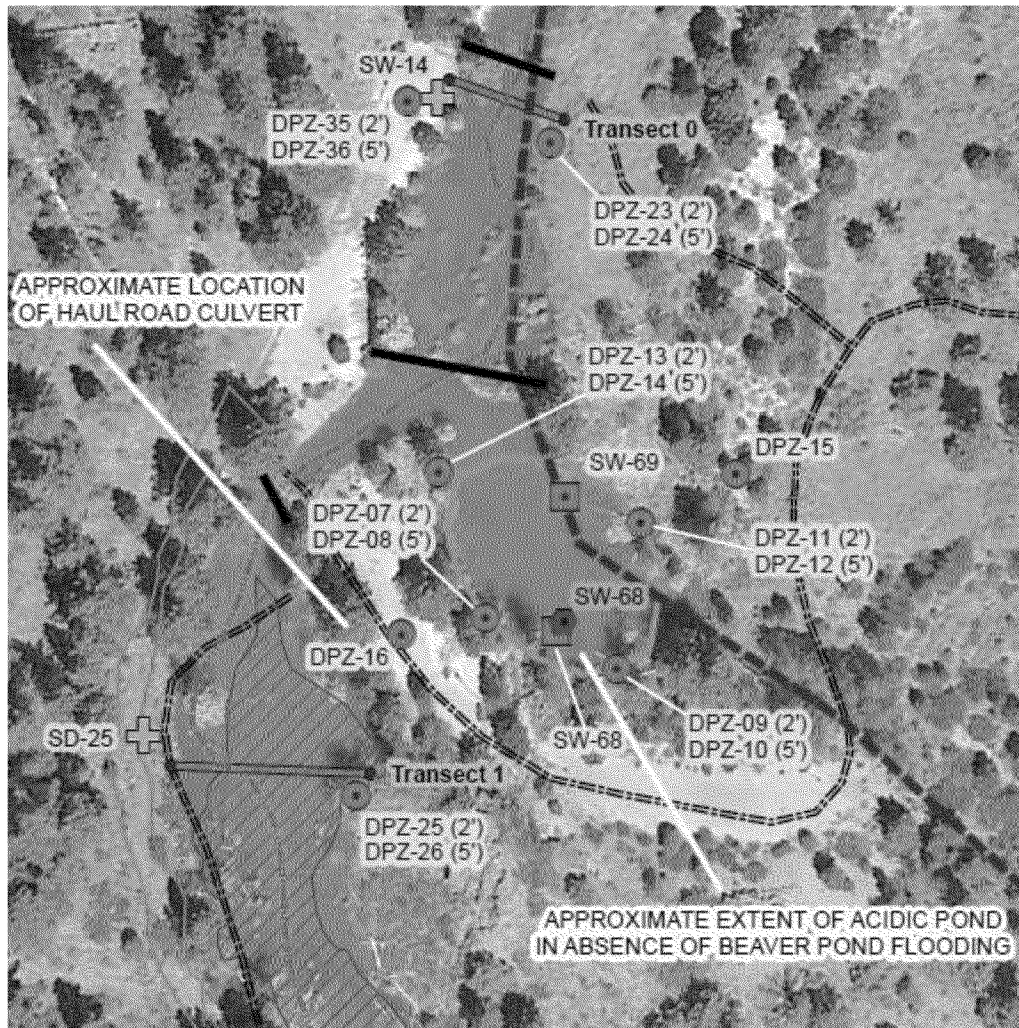
- ▶ LOC-35 (MW-46)
- ▶ LOC-36S (MW-45)

Total # monitoring wells = 55

Total # piezometers = 25



Leviathan Creek/Acidic Pond Surface Water/Groundwater Interaction Investigation



Installed:

- ▶ 36 drive point piezometers (16 pairs + 4 singles)
- ▶ 9 water level transducers in select drive point piezometers
- ▶ 3 surface water staff gages and stilling wells
- ▶ 13 surface water monitoring locations
- ▶ 3 water level transducers in select surface water monitoring locations
- ▶ 3 seepage meters

Surface Water/Groundwater Interaction Investigation (continued)



Scope of Work:

- ▶ Measured water levels in drive-point piezometers monthly
- ▶ Collected surface water samples and flow measurements in spring and late summer
- ▶ Collected groundwater samples from drive-point piezometers in spring and early fall



2016 Plant and Habitat-Related Soil Investigation

Locations:

- ▶ On-Property
 - ▶ 23 locations
- ▶ Downstream Study Area
 - ▶ 36 locations
- ▶ Reference Study Area
 - ▶ 15 locations

Plant Sampling and Analysis:

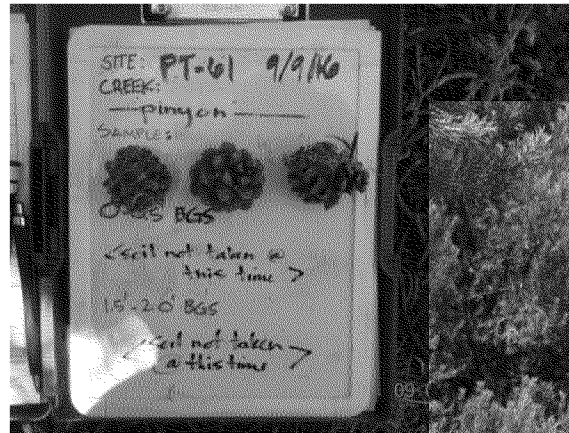
- ▶ Targeted plant tissue (stems, seed, leaves, fruit, etc.)
- ▶ 64 plant tissue samples collected

Habitat-Related Soil Sampling and Analysis:

- ▶ Collocated soil samples collected at two depths where possible
- ▶ 75 habitat-related soil samples

Sampling Status:

- ▶ Completed to extent possible



2016 Fish Survey and Sampling

Locations:

- ▶ On-Property
 - ▶ 3 reaches
- ▶ Downstream Study Area
 - ▶ 12 reaches
- ▶ Reference Study Area
 - ▶ 9 reaches (3 in Cottonwood and 6 in Mountaineer Creek)

Sampling and Analysis:

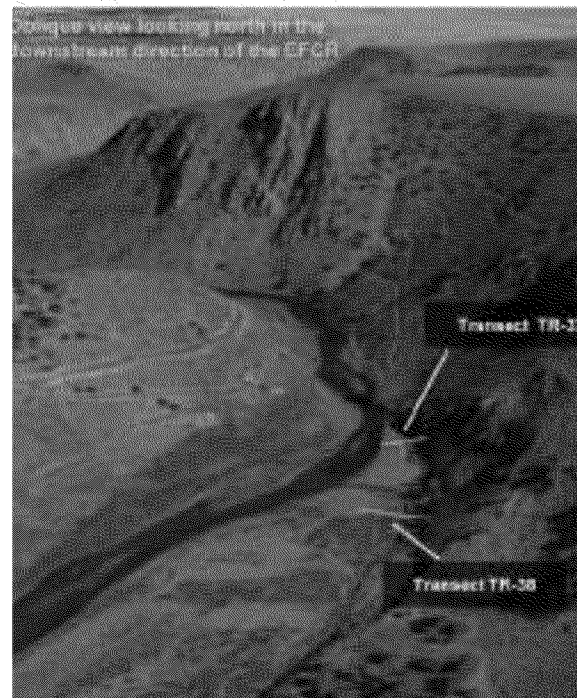
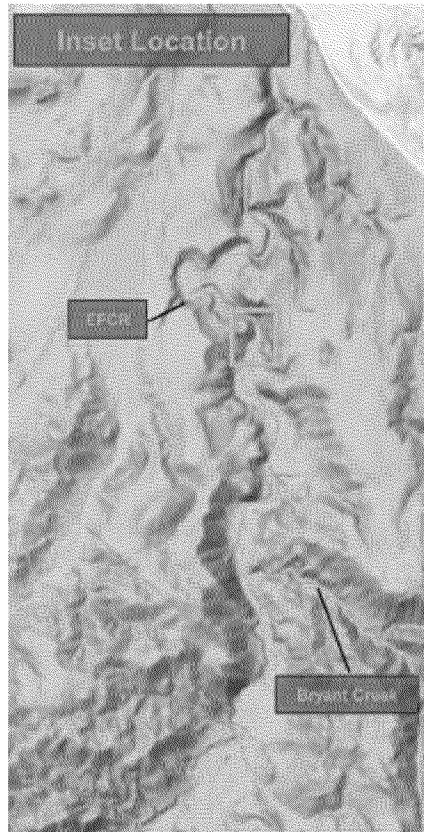
- ▶ On-Property: no fish present
- ▶ DSA: 36 individual and 13 composite fish samples
- ▶ RSA: 9 individual and 14 composite fish samples

Sampling Status:

- ▶ Complete



2016 East Fork Carson River Fluvial Soil and Surface Water Investigations



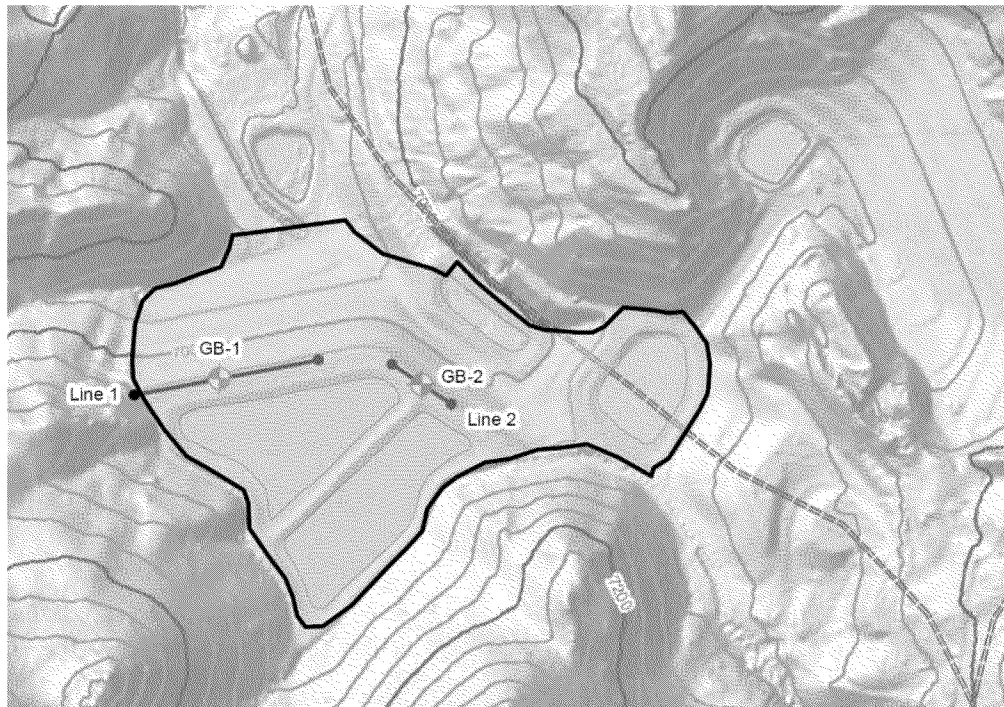
Locations:

- ▶ 10 Transects
 - ▶ 5 Upstream of Bryant Creek
 - ▶ 5 Downstream of Bryant Creek
- ▶ 3 Locations in each Transect
- ▶ 8 Surface Water Locations
 - ▶ 4 Upstream of Bryant Creek
 - ▶ 4 Downstream of Bryant Creek




Sampling Status:

- ▶ Completed except 8 surface water locations to be sampled in spring (high flow)

2016 Geotechnical Investigation



Explanation

-  Hollow Stem Auger Boring
-  Combination Hollow Stem Auger and Diamond Core Boring
-  Surface Geophysical Survey

- ▶ Completed review of existing soil and rock core
- ▶ Conducted four geophysical surveys at two locations on mine waste near Pond 2N/2S
- ▶ Drilled two geotechnical borings in mine waste near Pond 2N/2S
 - ▶ GB-1 to a depth of 61.5 feet
 - ▶ GB-2 to a depth of 133 feet
- ▶ Completed geotechnical/geologic mapping along Leviathan Creek between the Delta Area and the toe of the Leviathan Creek Basin Landslide

2016 Revegetation Treatability Study Investigation

3 Revegetation Plots ○

3 Hydrology Plots ○

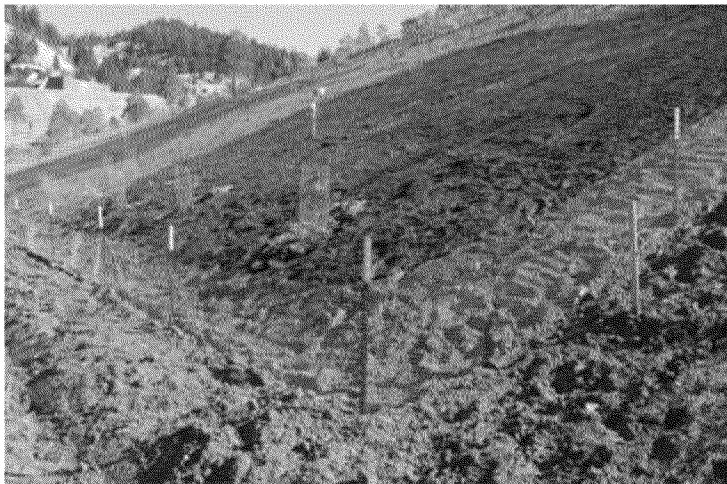


2016 Revegetation Treatability Study Investigation



Prepared three revegetation plots:

- ▶ Conducted initial soil sampling
- ▶ Performed deep lime/nutrient amendment incorporation
- ▶ Conducted post-amendment soil sampling
- ▶ Seeded and installed containerized plants
- ▶ Installed soil moisture and precipitation monitoring equipment with data loggers



Prepared three hydrology plots:

- ▶ De-vegetated half of the hydrology plot as a control
- ▶ Performed vegetation surveys
- ▶ Conducted initial soil sampling
- ▶ Installed soil moisture and precipitation monitoring equipment with data loggers

2016 Interim Combined Treatment



Objective

- ▶ Evaluate effectiveness and efficiency of HDS Treatment Plant to treat combined acid drainage (Adit, PUD, CUD, DS)

Benefits

- ▶ Simplify treatment by centralizing operations
- ▶ Data will support the Feasibility Study

Current Stage

- ▶ Construct pipeline to Convey PUD and Adit flows to HDS Treatment Plant

2016 Upper Pond Conveyance System Construction

Dual-Contained HDPE pipeline connecting Pond 1 and Pond 2 with Pond 4

- ▶ Above and underground sections complete
- ▶ Cross-over valves constructed

Pump Stations Constructed at Pond 1 and Pond 2

- ▶ Concrete pads constructed
- ▶ Electrical and communication panels installed
- ▶ Pumps installed

Access Road constructed at base of Pond 2 Slope



2017 Upper Pond Conveyance System Activities

Electrical and Controls

- ▶ Leak Detection
- ▶ Pull power cable and fiber optic through installed conduit
- ▶ Tie into HDS generators

Pump Station Piping and Instrumentation Installation

Programing

- ▶ Functional checkout of PLC program
- ▶ Commissioning of instrumentation

Asphalt Restoration

Final Commissioning



2015 FRI Data Collection Status

Study Area		Data Collection Activity															
		Mapping/Field Verification	Drilling/Well Installation	Groundwater Monitoring	Mine Waste Soil Sampling	Floodplain Soil Sampling	Soil Sampling	Stream Sediment Sampling	Meteorological Monitoring	Surface Water Monitoring	Source Monitoring	Acidic Pond Characterization	Upper Tributary Characterization	Storm Water and Snowmelt Monitoring	Plant/Soil Sampling	Sediment Quality Triad	Fish Surveys and Sampling
On-Property Study Area		X	Q3 2016	Q2 2018*	X	Q3 2016	Q2 2016	Q3 2016	X	X	X	Q2 2016	Q2 2016	Q3 2017*	Q4 2017**	X	Q3 2016
Off-Property Study Area	Downstream Study Area	X				Q3 2016		X		Q4 2016					Q4 2017**	X	Q3 2016
	River Ranch	X					Q2 2017**			Q2 2016							
	East Fork Carson River	Q2 2016					Q3 2017**			X						X	
	Ore Piles	X					Q2 2017**										
	Leviathan Mine Road	X					Q3 2016										
Reference Study Area		X	Q3 2016	Q2 2018*		Q2 2016	Q2 2017**	X		Q4 2016				Q3 2017*	Q4 2017**	Q3 2016	Q3 2016

1. Estimated completion dates subject to change based actual field implementation time, weather conditions, and contractor

X = Task complete (for select activities assumes 2 years monitoring sufficient)

= Task in progress (for select activities assumes 2 years monitoring needed per work plan)

= Task not started



QX = Quarter in which field work estimated to be completed

* = Based on 2 years monitoring per work plan

** = For select locations subject to NHPA process

2016 FRI Data Collection Status

Study Area		RI Data Collection Activity															
		Mapping/Field Verification	Drilling/Well Installation	Groundwater Monitoring	Mine Waste Soil Sampling	Floodplain Soil Sampling	Soil Sampling	Stream Sediment Sampling	Meteorological Monitoring	Surface Water Monitoring	Source Monitoring	SW / GW Interaction	Upper Tributary Characterization	Storm Water and Snowmelt Monitoring	Plant/Soil Sampling	Sediment Quality Triad	Fish Surveys and Sampling
On-Property Study Area		X	X	Q2 2018*	X	Q3 2017	X	X	X	X	X	Q4 2017	Q4 2017	Q4 2017*	X	X	X
Off-Property Study Area	Downstream Study Area	X				X		X		Q4 2017					X	X	X
	River Ranch	X					Q2 2017**			X							
	East Fork Carson River	X					X			Q2 2017						X	
	Ore Piles	X					X										
	Leviathan Mine Road	X					X										
Reference Study Area		X	Q3 2017	Q2 2018*		X	X	X		X				Q4 2017*	X	X	X

- X** = Task complete (for select activities assumes 2 years monitoring sufficient)
 = Task in progress (for select activities assumes 2 years monitoring needed per work plan)
 = Task not started

QX = Quarter fieldwork estimated to be complete (may change based on time required, weather conditions, and contractor availability).

- * = Based on 2 years monitoring per work plan
 ** = Complete except deep samples at 6 locations

2015 Feasibility Study Activities Status

Investigation/Study	Field Data Collection	Treatability Study	On-Going Monitoring
Geotechnical Investigation	Q2 2017*		Q3 2018
Revegetation Treatability Study	Q4 2016	Q4 2016	Q3 2018

Estimated completion dates subject to change based on actual field implementation time, weather conditions, and contractor availability.






= Task complete
 = Task in progress
 = Task not started

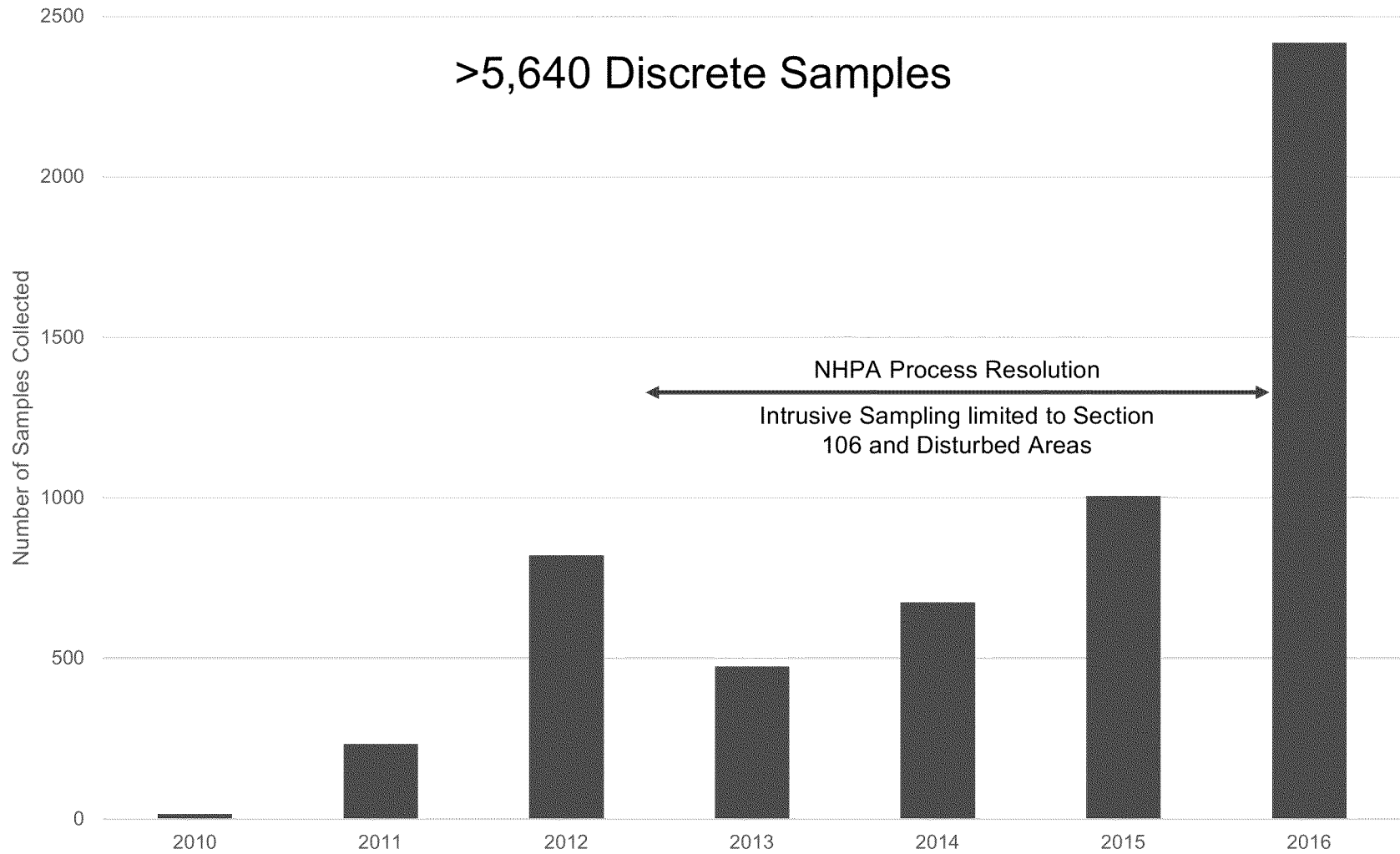
QX = Quarterfield work estimated to be complete
 * = For select locations subject to NHPA process

2016 Feasibility Study Activities Status

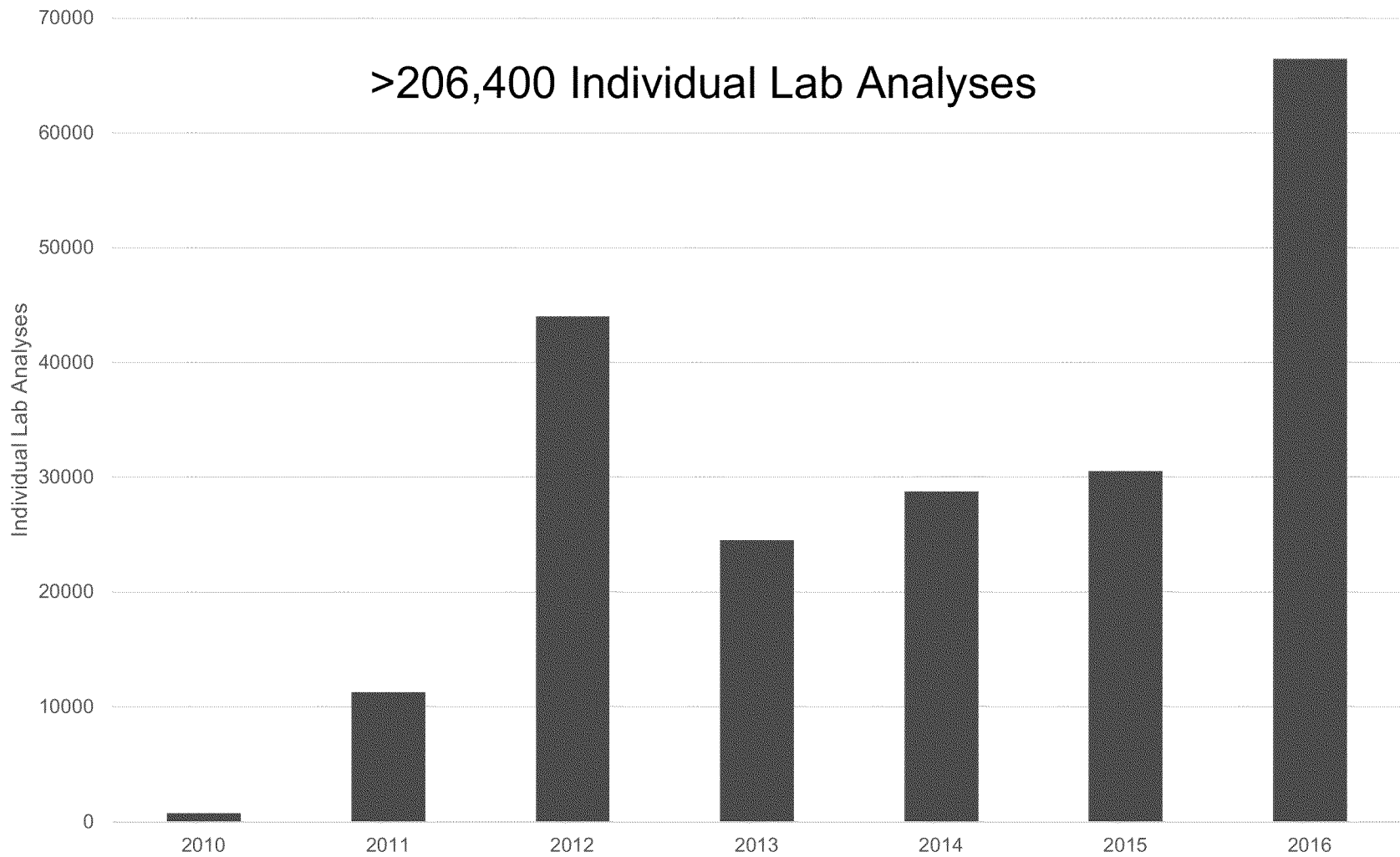
FS Investigation/Study	Field Data Collection	Treatability Study	Monitoring
Geotechnical Investigation	Q2 2017		Q3 2018
Revegetation Treatability Study	X	X	Q3 2018
Interim Combined Treatment	Q2/Q3 2017	Q2/Q3 2017	

-  X = Task complete
 = Task in progress
 = Task not started
 QX = Quarterfield work estimated to be complete (may change based on time required, weather conditions, and contractor availability).

Approximate Number of Samples Collected from 2010 - 2016



Approximate Number of Individual Lab Analyses for Samples Collected 2010 – 2016



2017 Planned RI Field Activities*

On-Property & DSA On-going Monitoring Programs

- ▶ Groundwater
- ▶ Upper Tributary Groundwater and Surface Water
- ▶ Meteorological Conditions
- ▶ Surface Water and Surface Water AD Discharge
- ▶ Storm Water and Snowmelt Runoff
- ▶ CUD and Aspen Flow Station

On-Property Area

- ▶ Stream Sediment and Floodplain Soil in Leviathan Creek Beaver Dam/Pond Complex
- ▶ LCSA Surface Water/Groundwater Interaction (Amendment 11)

Off-Property Area

- ▶ No work planned*

Drilling

- ▶ Hydraulic testing of 5 wells installed in 2015 and 9 wells installed in 2016

Reference Area

- ▶ Mapping in Upper Leviathan and Aspen Creeks

Multiple Areas

- ▶ Plant/Soil Sampling – Plant biomass estimation and bioaccessibility testing

Supplemental Study Areas

- ▶ River Ranch – Collect soil samples from 2 to 6 foot depths at 6 locations
- ▶ East Fork Carson River – Collect surface water samples from 8 locations in spring

*Subject to change as 2015/2016 data evaluation continues

2017 Planned FS Field Activities

Geotechnical Investigation

- ▶ Rock coring, televiewer survey, and inclinometer/pressure transducer installation in GB-01
- ▶ Monitoring of slope inclinometer/pressure transducers

Revegetation Treatability Study

- ▶ Continue monitoring of hydrology and revegetation plots

Interim Combined Treatment

- ▶ Completion of the upper pond conveyance system
- ▶ Shakedown and startup of the upper pond conveyance system
- ▶ Perform interim combined treatment testing

Beaver Dam / Pond Complex Focused Feasibility Study

- ▶ Reduce water impoundment in select beaver ponds
- ▶ Evaluate sediment control measures
- ▶ Performance monitoring

2017 Data Interpretation and Reporting Activities

- ▶ Continue data evaluation and interpretation
- ▶ Continue analysis of media-specific data sets for inclusion in the Site Characterization Report
- ▶ Prepare draft Site Characterization Report

2017 Risk Assessment Activities

Human Health Risk Assessment

- ▶ Recent EPA acceptance of revised exposure assumptions and BHHRA Work Plan (2016)
 - ▶ Response to remaining comments and finalization of work plan
 - ▶ Evaluate data sets for use in risk assessment (as appropriate)
 - ▶ Process will be a combination of screening-level comparisons and Exposure Point Concentrations (EPCs) in technical reports followed by baseline-risk assessment

Ecological Risk Assessment

- ▶ EPA Conditional approval of BERA Work Plan – November 3, 2015
- ▶ Final BERA Work Plan submitted December 3, 2015
 - ▶ Evaluate data sets for use in risk assessment (as appropriate)
 - ▶ Process will be a combination of screening-level comparisons and EPCs in technical reports followed by baseline-risk assessment